Yankeewatch

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Integrated Computing

The Internet: Facilitating Electronic Commerce

Executive Summary

The vast web of networks known as the Internet presently has more than 15 million users worldwide. Although the Internet has its roots in academic and U.S. Department of Defense (DoD) circles, business use is now the fastest growing part of the network and currently accounts for nearly 50 percent of the total traffic, up from only 20 percent a few years ago. As policy makers, technology companies, and media giants implement plans for building the much-heralded information superhighway, the Internet is serving as the prototype marketplace for electronic commerce. Corporate information systems (IS) departments are finding that the Internet can not only serve to expand the company's internal computing resources, but it can also serve as a cost-effective means for extra-company communications with the outside world.

This Yankee Watch *examines how businesses are currently using the Internet and how they might in the future. With the shift toward decentralized business-model client/server networks that connect thousands of people, the Internet meshes well with the new IS paradigm. It lets individuals search through vast electronic libraries and exchange electronic mail (E-mail) and documents with colleagues and customers worldwide. However, before the Internet can be fully commercialized, certain barriers (including a lack of tight security, low user-friendliness, and a primitive service-and-support infrastructure) must be overcome. But these should not scare companies away. As a first step, the Yankee Group advises corporate users to get accounts on the Internet and learn to navigate its resources. Users should also make use of the low-cost software, databases, and services on the network, and begin setting up pilot applications there.*

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What Is the Internet?

The Internet (the "Net") is a scheme for interconnecting some 45,000 public and private computer networks, half located in the United States and half in 91 other countries. This interconnection is accomplished through a common set of communications protocols based on the Transmission Control Protocol/Internet Protocol (TCP/IP) de facto standard. There are now about 1.5 million host systems connected to the network, each handling an average of 10 users, thus yielding the estimated total of 15 million users. The network's traffic volumes are growing at an estimated 15 percent per month, and user volume is increasing by about 1 million per year. The network started in 1969 as ARPANET and was used primarily for DoD researchers. It grew up as a noncommercial entity subsidized by the government. Most of the costs of building and maintaining the current network are paid by user access fees. But the Internet still receives about $11.5 million per year in government funds through the National Science Foundation (NSF), which has a steering committee for setting network policies. Among those is the "acceptable use policy," which prohibits advertising, promotion, and any network traffic that doesn't support education or government research. Those policies are in effect on parts of the NSFNET backbone, the NASA Science Network, and a few other subnetworks. But these days, only relatively small portions of the Internet still have such restrictions against commercial traffic. And even those restrictions are rapidly falling by the wayside.

Essential Features for Business on the Net

E-Mail

The Internet is more than just E-mail. But historically, this has been the most popular use of the Net. Currently, about 17 percent of Internet traffic is E-mail, down from 25 percent in 1989, according to Advanced Network & Services, Inc., the largest Internet access provider (see Exhibit 1). In many companies, particularly in high-tech industries, E-mail is now becoming a substitute for paper mail because it is much faster. Provided you have a document in electronic form, it can also be a cheap substitute for overnight package delivery. In addition, E-mail is often a more effective way of performing routine communications that would otherwise be done over the telephone—the recipient can respond to the communication

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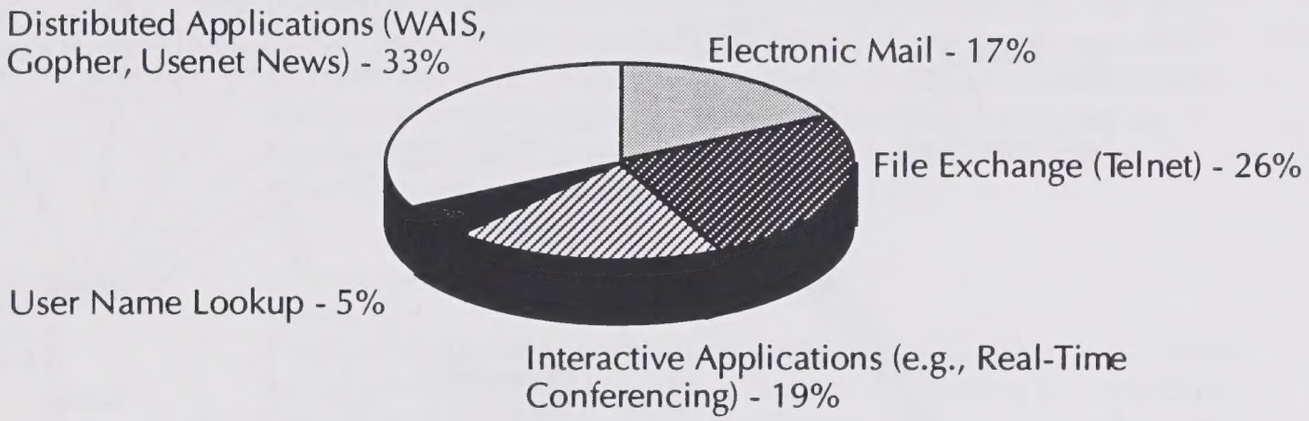
Exhibit 1
Internet Usage

Source: Advanced Network & Services, Inc. and the Yankee Group

Percentage Measured in Packets



when it's convenient, or in some cases, can even automate a response. All Internet members have an E-mail address that indicates where they work and the type of institution to which they belong. Addresses ending in *.com* are "commercial" users.

By joining the Internet, businesses can expand their corporate E-mail service to include communication with millions of other busin people, thus taking the first step toward setting up a "virtual corporation" that extends outside the company's traditional boundar

The Commercial Internet Exchange (CIX)

About 30 of the network access providers have formed an alliance called CIX. These companies maintain a backbone of the Internet that is managed and funded separately from the government-subsidized NSFNET backbone. Thus, this part of the Internet has no acceptable use policies and can be used for any intended purpose. It is now the fastest growing part of the Internet (see Exhibit 2).

Wide-Area Information Servers (WAIS)

WAIS is a way of publishing and searching through libraries of documents distributed across the entire Internet. The WAIS concept was pioneered by WAIS Inc., a Menlo Park, California, outfit that began in 1989 as a joint venture between

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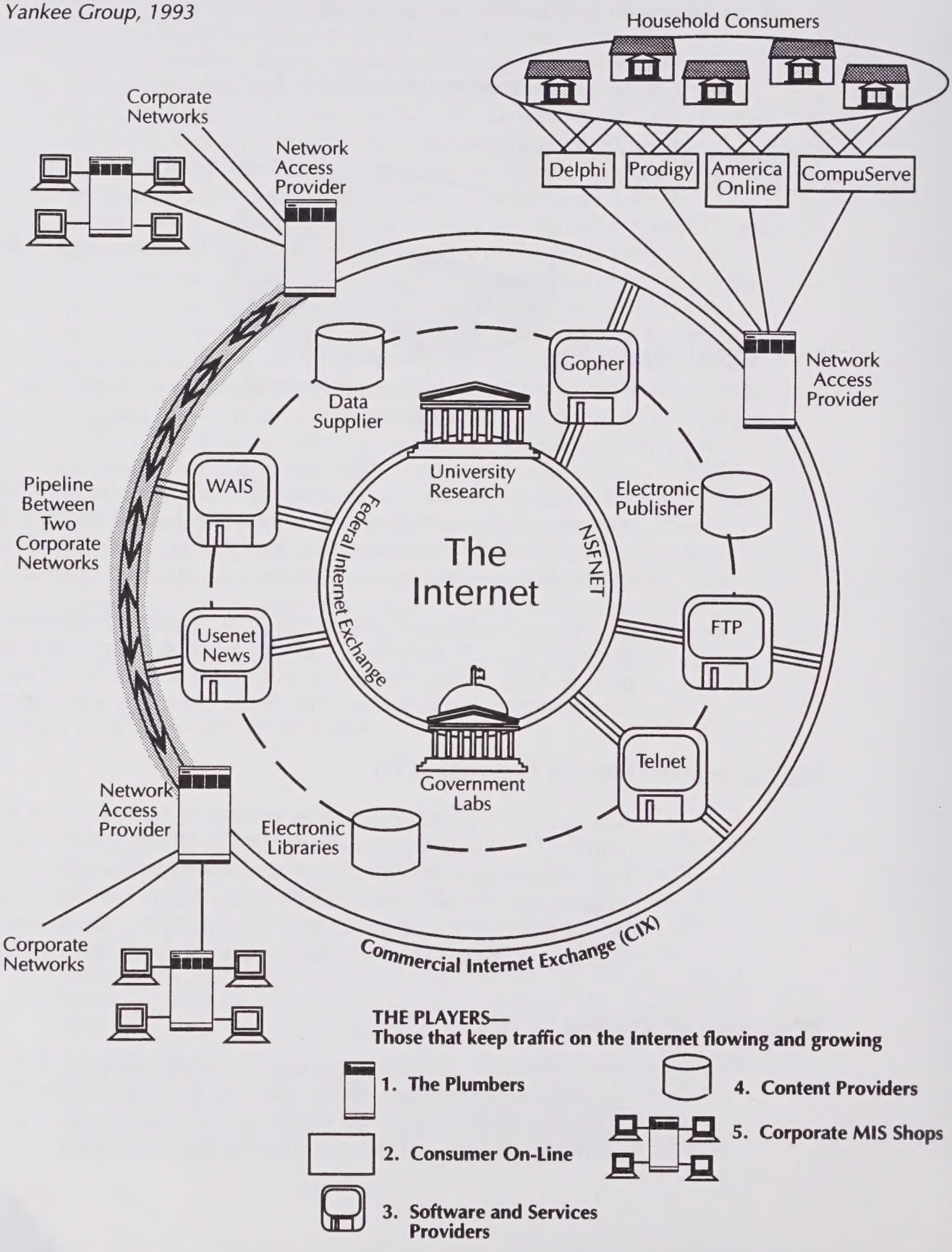
Exhibit 2
Spokes of the Internet Wheel

Source: the Yankee Group, 1993



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four companies from diverse industries: Apple Computer, Inc.; Big Six accountancy Peat Marwick, Mitchell & Co.; supercomputer maker Thinking Machines Corp.; and publisher Dow Jones & Co, Inc. Now an independent software house with seven employees, WAIS supplies electronic publishing software and services. Customers download the company's software from the Internet, and then use it to format and publish technical documents on the network for anyone who needs them. Built into the software are wide-ranging search capabilities, which allow people to sift though volumes of text using key words as search criteria. Distributed computing applications such as WAIS now account for 33 percent of network traffic, up from 10 percent in 1989.

Gopher

Another distributed computing application, Gopher is a menu-based system for exploring the Net and retrieving information. Developed at the University of Minnesota, it is a way of hiding the complex command language (rooted in UNIX) that Internet users would otherwise need to learn. In fact, the term "Gopher" has been taken to represent the class of information retrieval applications—they are now called "gophers." For example, if you're interested in business gophers, you would choose "business" from a main menu of topics. You might then be presented with choices, such as getting access to Harvard Business School case studies or a copy of the NAFTA agreement. With gophers, users don't have to learn how to "Telnet" (an Internet mechanism for accessing different host computers in search of the information you want). The gopher scheme also alleviates the need for learning File Transfer Protocol (FTP) commands, a complex scheme for transferring files from one host to another. Such file exchange accounts for 26 percent of the Internet traffic. As the gopher tools become increasingly popular, more and more businesses are adding their information and databases as choices on the gopher menus. In this respect, we expect that gophers will drive on-line marketing.

Graphical User Interfaces (GUIs)

Just as Microsoft Windows makes MS-DOS easy to use, a good GUI can greatly simplify Internet use. But most users are still forced to access the Internet in text mode because graphical interfaces for the Internet are a relatively new phenomenon.

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There are a few that are available. One, the Global Network Navigator (GNN), developed by O'Reilly & Associates, Inc. in Sebastopol, California, provides a graphical map of the network, as well as a point-and-click interface for WAIS libraries and gopher menus. The GNN is free for users and is supported by advertising included in a quarterly electronic magazine packaged with the software. Another Internet GUI comes from Spry, Inc., a start-up in Seattle, Washington, that is now shipping Air Navigator, a $149 program that runs on top of Windows. The software presents graphical front ends for the Internet's mail system as well as the gopher menus and the Usenet system of electronic bulletin boards. The Yankee Group believes that these types of programs are essential for widespread corporate acceptance and adoption of Internet services.

The Players—Those That Keep Traffic Flowing and Growing

The Plumbers

There are now dozens of so-called "network access providers" that link companies to the Internet for a fee. They are referred to as "the plumbers" because they are the ones who have to figure out the network topology, setting up transmission lines and routers, and generally working on the data pipelines. For corporate customers, the cost of their services usually runs between $5,000 and $100,000 per year, including hourly rate charges and flat monthly service fees, depending on the company's size. Some are large national providers, such as Advanced Network & Services, AT&T, and Sprint. But most are small entities (e.g., New England's NEARnet) that spun off from universities or were founded by entrepreneurs. Like NEARnet, most of these companies function somewhat like local phone companies, providing service mainly to their home region. But unlike the Baby Bells, competition is springing up in most local areas. For instance, the Washington, D.C., area is served by UUnet Technologies and Performance Systems International, Inc. (PSI). In addition, there are several providers, such as Delphi and the World, that let unaffiliated individuals join for a monthly fee.

With the Internet growing and changing so rapidly, the plumbers are too busy signing up subscribers to think about much else. But these companies face stiff challenges: First, they must simplify their fee structures, which vary widely from one

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provider to another. Second, they must strengthen their service and support organizations. Third, they must continually upgrade their networks. As more and more users sign on, network performance tends to degrade.

Cable Companies—Future Plumbers?

Cable companies, which have higher bandwidth "pipes" into homes than the phone companies, may serve as a wildcard in the Internet market. As the "virtual corporation" concept grows in popularity and includes individual work-at-home contractors, cable companies are poised to support that market. Not only do 60 million households (and now many business entities as well) have cable access, but the transmission speeds are much higher than commonly available modems transmitting data over telephone lines. (Line speed for cable is up to 10 megabits per second versus common high-performance modem speed of 14.4 kilobits per second.)

In this domain, the most significant deal so far has been between PSI, a major Internet plumber, and Continental Cablevision Inc., a major consumer cable television company. With a special cable converter, a Continental subscriber would plug a PC into the cable line, which would be linked into PSI's Internet connection. We believe the cost of such services—estimated between $75 to $100 per month—would have to come down for cable to become a viable alternative to telephone lines.

Consumer On-Line Services

America Online (AOL), Prodigy Service Co., and CompuServe Information Systems, Inc. are all in the early stages of building extensive gateways to the Internet, starting with E-mail exchange. These services can be user-friendly alternatives to accessing the full Internet. However, they are geared to consumers and do not contain the massive quantities of business and government information, or the other resources found on the Internet. So far, AOL is the only service to announce that it will go beyond an E-mail gateway and provide expanded Internet service. If AOL and other services can develop graphical front ends for services like WAIS and Gopher, the Yankee Group believes that they would be attractive to business users. But that would likely be an expensive undertaking. And it would probably require a new fee structure for business users. A more likely scenario would

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be that the service providers acquire, rather than make, the software.

Software and Services Providers

The Internet is a cost-effective way to distribute software and services over a wide area. But sometimes there are competing products on the network that were developed at universities and are available to members at no added cost. Those products include Gopher and the World Wide Web, a hypertext-based searching tool. The abundance of freeware makes it difficult for commercial companies to go in and charge for their products.

But the Internet is now undergoing a much-needed transition. Much of the software on the Net does not include good customer support or frequent updates. And as businesses leverage this freeware, integrating it into corporate computing solutions, customers will demand more and more service. New companies will crop up to supply it. A good example is WAIS Inc. It is starting to charge commercial clients a fee for support and upgrades, and it plans to grow into a more traditional software firm. The Yankee Group believes that the Internet is in the early stages of spawning a huge industry of wide-area network (WAN) applications software.

Content Providers

Currently, the on-line publishing industry suffers from the same impediments as the network software business. Much of what is on the Internet, from human genome databases to the *Federal Register*, is available for free. Publishing houses and database suppliers, however, can add value far above what is available for free by formatting their content in an attractive way and, in some cases, selling the tools used to search, retrieve, and analyze the information they are selling.

So far, a few companies are doing just that. Two of the earliest Internet content providers are Mead Data Central, publisher of Lexis and Nexis, and WESTLAW, publisher of legal texts. The Yankee Group believes that the Internet will become one of the most popular ways of selling databases, electronic books, technical journals, and periodicals.

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Corporate MIS Shops

The businesses that are joining the Internet not only make use of its services, but sometimes add their own services to the network. Many companies don't realize that they are in the information business and that the software, electronic texts, and databases that they have developed in-house could also be sold on the open market, thus providing an additional revenue stream. The Internet can be an effective and low-cost way of distributing such products to a wide customer base. Examples of these types of products and services range from qualified customer mailing lists to financial and investment services to video, sound, and graphics libraries. A particularly good example of a company providing products and services on the Net is Sun Microsystems Inc., which is profiled in a case study below.

Business Case for Using the Internet

The quantifiable benefits of conducting business on the Internet fall into two categories:

- Cheaper ways to do tasks that businesses normally do in other ways, and
- Opportunities to do new things that would not get done any other way.

Cheaper Ways to Do Tasks That Businesses Normally Do in Other Ways

Low-cost communication is perhaps the biggest area of savings. On the Internet, swapping messages with co-workers and business partners, and exchanging electronic contracts with suppliers cost next to nothing in transmission charges. Large companies can measure such savings by looking at their corporate budgets and comparing what they spend for telephone, electronic mail, fax, messenger, and travel both before and after incorporating the Internet in their daily business tasks.

Tapping into remote supercomputer sites is much cheaper on the Internet. When they need to run complex simulation tests on new camera designs, engineers at Eastman Kodak Co. in Rochester, New York, for instance, use the Internet's Telnet utility to timeshare on a supercomputer center located at the

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University of Illinois. The engineers can submit batch jobs over the Net and then view the results on their local terminals. The cost of doing this on the Internet is considerably less than it would cost to buy the supercomputer time on the open market.

Businesses can access commercial, academic, and government information for a fraction of the time and cost that it would take to submit requests in writing and have paper documents shipped. The government information includes listings of new federal contracts, procurement schedules, the *Federal Register*, and the *Commerce Business Daily*. In addition, quick searches can be performed on the Library of Congress card catalog.

Opportunities to Do New Things That Would Not Get Done Any Other Way

The Internet is famous for bringing people together who would never meet otherwise. These by-chance meetings take place primarily on the Usenet electronic bulletin boards. While bulletin boards have become famous for their discussions on everything from sex to food to movies, many of the more than 10,000 different newsgroup topics on Usenet are serious and pertain directly to business interests. Thus, employees from different companies can "meet," decide that they have common interests, and decide to pursue a joint project or venture, as in the Lockheed example below.

With access to millions of minds, Internet users can pose questions on the Net and get a whole pile of answers within hours—provided that they know the right area of the Net for their posting. For example, in the summer of 1993, during the massive flooding in the Midwest, a librarian in Des Moines, Iowa, inquired on the Internet how people in his area should go about fumigating their water-logged homes and farm equipment. "I couldn't find that information in any books," the librarian said. Many business and technical questions can be answered by posting them on the Net. There are no other equivalent resources for tapping into so many minds at once.

Lockheed Corp.'s Use of the Internet

A major defense contractor and electronics manufacturer, Lockheed has been decentralizing its management structure over the past few years. Headquartered in the Los Angeles, California, suburb of Calabasas, the company now has about 86,000 employees and has laid off around 10,000 employees

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within the past few years. Along with the downsizing came a new requirement to push decision-making into lower levels of the organization, thus bringing on an urgent need to replace the company's centralized mainframe systems with a faster, more flexible, client/server network.

Business Objectives

In 1991, the employees within the scientific and engineering division of Lockheed decided that they needed a fast and efficient way of collaborating with each other electronically. The engineers, located in six different states, needed to be able to exchange technical documents with each other, receive daily updates on government contract data, and have a reliable way of collaborating with outside suppliers, contractors, and research houses. The system needed to work with the existing computers that most of the employees had on their desktops—scientific workstations running UNIX, and IBM PC-compatibles. When the group started designing the system, it encountered resistance from the central MIS organization at Lockheed, which had been supplying the group with nearly all its applications. That meant that the engineering group had to develop its new application using its own IS budget, which was minimal.

The Solution

The corporate vice president of science and engineering approved a plan to download the necessary applications software from the Internet. These applications would form the core of the new Technology Broker System (TBS), thus named because it would act as an information trader, or broker, for the users. Since the software was public domain, it carried no license fees whatsoever. Software and utilities downloaded by Lockheed from the Internet to portions of its corporate network included the WAIS electronic publishing and searching software, the Gopher menu system for exploring the Internet, bulletin board software that allowed Lockheed to set up its own internal "newsgroup," the World Wide Web hypertext searching software, and utilities needed to transfer files between different computers using the Internet's FTP protocol. "We created our own little microcosm of the Internet," says Mike Carroll, Lockheed's manager of advanced software applications.

For security reasons, the company decided to "recreate" the Internet on its own computers, rather than have the employees

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use the actual Internet computers. "We built a firewall," says Carroll. Since they have the Internet applications software, Lockheed users can search the entire Internet from their corporate systems. But it's only one-way: the millions of Internet users cannot tap into the Lockheed systems. The only exceptions are that Lockheed employees can receive E-mail from anyone on the Internet and can read postings in all of the Internet's newsgroup bulletin boards. As an additional security precaution, all the Internet software is scanned for viruses.

Presently, between 1,000 and 2,000 Lockheed employees use TBS, which is controlled by seven servers. With the WAIS software, government information and contract data (including the *Commerce Business Daily*) are available at all times for all users to search through for themselves. WAIS fully indexes all the information so that it can be searched using key words. Previously, this information was stored on a Lockheed mainframe and the volumes of constantly changing requests for individual reports were handled by a small group of managers, thus creating a bottleneck. Through its use of the Internet, and TBS in particular, Lockheed has removed the information float. The result is faster access to more information, enabling quicker and more intelligent decisions, says Carroll. In the future, by eventually phasing out its central clipping service entirely, Lockheed expects to save tens of thousands of dollars per year.

The TBS system also allows the company's employees to collaborate better. With several plants located in California, New Hampshire, Georgia, Texas, Colorado, and Indiana, the employees had previously found it next to impossible to coordinate what projects they work on and how they deploy their resources. With the Internet, it's much easier. For example, a group of engineers in Calabasas was deciding whether to subcontract a new project to an outside firm. But through interactive bulletin board discussions on NetNews (Lockheed's Internet-based newsgroup), a workteam in Georgia learned of the project, volunteered, and proved that it would be equipped to do the project. By fostering this type of communication, Lockheed was able to keep that work within the company, thus saving the approximately $200,000 it would have paid to an outside contractor. With the improved communications, Lockheed expects to achieve this type of savings regularly. Lockheed employees can also view the résumés of people relocating within the company due to downsizing. By searching through résumés on WAIS, Lockheed

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managers are able to reassign employees much more easily, thus preventing the loss of talent.

Finally, Lockheed claims that its TBS also fosters extra-company communications. Employees using TBS exchange thousands of E-mail messages each month with people outside Lockheed. And although nobody would say that Lockheed engineers are compensated on how many E-mail messages they send or receive each week, the company views E-mail as a cheaper and more effective means of communication. In fact, Lockheed says it was guided in this decision by an Institute of Electrical and Electronics Engineers (IEEE) study claiming that E-mail is considerably cheaper than postal mail or phone calls.

Through WAIS, Lockheed employees have access to a large electronic library of information that the company couldn't afford to create in-house. And through the Internet's public newsgroups, Lockheed workers can participate in discussions on everything from the engineering of the latest fighter jet to foreign affairs. For example, one Lockheed software developer posted a paper he wrote about a new intelligent database searching method the company was trying to implement. The paper got a large response from other researchers and developers all over the world. One of the responses was from the German Institute for Artificial Intelligence. The electronic discussion led to visits back and forth between the two parties. And now Lockheed and the institute are forming an alliance to do research and development (R&D) on this new method. Without the newsgroups on TBS, that connection would never have been made. It will lead to inexpensive labor in the form of graduate students associated with the German institute. In the longer term, Lockheed says it may lead to further business opportunities in Europe.

Return on Investment

To set up TBS, Lockheed needed to purchase Ethernet cards for its workstations, at a cost of $100 to $200 each, plus $100 per workstation for the necessary TCP/IP driver software. A $20,000 router was necessary to link the workstations to the wide-area backbone. Then there were the "soft costs" of installing the free Internet applications, plus maintaining the software, which costs just a few hundred dollars per week. In terms of measuring the return on investment, "we didn't put any rigid metrics into place," says Carroll. But he says that

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there is an obvious payback in terms of increased communication and faster and better decision-making. Lockheed management considers the TBS/Internet system a low-budget pilot project that has paid for itself many times over. And it will lead to further use of Internet resources corporate-wide. One sign of the success of the project is the interest in and acceptance of the system within the previously skeptical MIS organization. That group expects the Internet to be a fundamental component of its enterprise distributed computing strategy.

Internet Use at Sun Microsystems

Sun Microsystems makes workstations that are mainly used by highly computer-savvy scientists, engineers, and researchers. Thus, many of its customers have been using the Internet for years. In addition, all of Sun's employees have Internet accounts. This gave Sun a big opportunity to leverage the Internet's resources for competitive advantage.

Business Objectives

With fierce price wars driving down the margins in the computer business, Sun is constantly under pressure to reduce its operating costs. Sun's Customer Service Division was looking for a way to reduce its costs in telephone technical support and distribution of software updates and bug fixes. It was also looking to improve customer service by speeding up response to requests and providing accurate information.

At the same time, Sun's Education and Research Division was looking for new and innovative ways to bring in new revenue streams. It saw a business opportunity in commercializing specific aspects of the Internet and in bringing order to the way software and information is distributed and supported there. The Internet has a much-deserved reputation for being an unsettled electronic frontier because much of the content available is placed there for the taking. It's also generally disorganized, and there is no one to provide reliable customer support.

The Solution

For the problem of providing cost-effective customer support, Sun came up with SunSolve, an information resource that any

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customer can tap into over the Internet. SunSolve went on-line in August 1993. By accessing SunSolve and placing a technical question about Sun hardware or software on a bulletin board, a customer can get an answer within minutes. In addition, customers are alerted when new versions and upgrades of Sun software become available for downloading. Sun also distributes bug fixes via SunSolve.

To capitalize on the commercialization of the Internet, Sun came up with SunSite. The first SunSite runs on a bank of servers at the University of North Carolina at Chapel Hill. It went on-line in 1992. Future ones are planned for London, England, and Tokyo, Japan. SunSite is a 12-gigabyte data bank of software, documents, technical papers, and product catalogs. Its main value is that it acts as a central marketplace for all the popular Internet applications. Customers can download client versions of WAIS, the World Wide Web, Gopher, and hundreds of public domain programs. Electronic documentation is available there as well. SunSite content also includes all official documents published by the White House and the U.S. Congress. That includes everything from the NAFTA agreement to the Federal Budget to the Clinton Health Care Plan. Because the system is based on the WAIS electronic publishing and information retrieval system, Sun is adding value to these publicly available documents The text is formatted, fully indexed, and searchable. In addition to the government information are technical papers and university research. Finally, the SunSite content most strategic to Sun is the Sun Library, a vast listing of all the software that runs on Sun hardware. The software includes everything from multimedia design tools to text editing systems to audio, graphics, and video libraries.

Return on Investment

Since SunSolve went on-line on the Internet in June 1993, Sun customers have downloaded 137,000 software patches. Distributing those patches via conventional means required copying the program onto a magnetic tape reel and mailing it to the customer at a cost to Sun of $100 per tape. (Software patches generally fit on a single tape.) These numbers suggest savings of $13.7 million in the last six months. However, Sun says that because of the ease of use and accessibility of SunSolve, demand for these software patches has increased tenfold. Consequently, the real savings over the last six

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months have been close to $1.37 million. Either way, the company claims the saving generated by SunSolve exceed by many times the cost of developing the application. And savings aside, the increased number of patches distributed has resulted in an overall increase in quality of product. This means there are more satisfied customers.

SunSite has been a bigger hit with the Internet than Sun had expected. According to Katherine Webster, Sun's manager of information sharing, Sun had predicted that SunSite would be accessed about 10,000 times per day. Currently, it is being accessed 30,000 times per day. The project has been a big money-saver because the company no longer has to publish and distribute paper versions of its Sun Library catalog, which used to cost $20,000 quarterly to produce. With all the government documents and technical papers creating traffic on SunSite, customers find it convenient to stop by and search the Sun Library. This has led to increased sales of Sun-compatible software, which in turn has generated additional hardware sales for Sun, Webster says.

Yankee Group Recommendation

Corporate users should obtain accounts on the Internet. Novices should begin using E-mail, then build from there. If there is resistance within the MIS group to supporting this effort, a small group of users should sign up on their own. **Some of the most successful Internet applications have started as pilot projects outside the central MIS group.**

The Internet should be an adjunct to your company's existing information infrastructure. **A corporate information system that only allows employees to communicate with each other is like a phone system that doesn't allow you to dial outside the company.** With distributed networks forming the backbone of today's virtual corporations, the Internet is a cost-effective way of making your network seem bigger and more powerful than it really is. MIS should aim to integrate the internal network seamlessly with facilities on the Internet, without compromising security. Lockheed's "firewall" approach is an intelligent way to accomplish this.

Businesses should set up corporate-wide Internet applications. The best way to leverage the Internet is to use the applications software that it offers. Make Gopher searching and WAIS libraries a menu item on every corporate PC. **To add additional**

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revenue stream to your business, consider taking corporate databases or in-house applications that have marketability and place them up for sale on the Internet.

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December 9, 1993

Dear Brewster,

I am writing to thank you for your participation in the recent Yankee Group research project on the commercialization of the Internet. Evan Schwartz, the researcher, appreciated your candor and insight. We expect the white paper (a copy is enclosed) will help enlighten the Yankee Group clients on the benefits of entering this new digital world that exists outside the boundaries of their respective organizations.

Sincerely,

Jeff Leopold

Jeff Leopold
Director, Integrated Computing Planning Service